

Javier Lopez-Gomez □ javier.lopez.gomez@proton.me □ www.jalopezg.dev

HPC/low-level Software Engineer





Professional Profile

Experienced HPC and low-level C/C++ software engineer with expertise in Operating System internals, Microcontroller firmware, and Compiler design / implementation. Highly motivated, fast learner. Enjoys the development of complex software systems where efficiency matters.

Languages

Spanish Native

English C1

German A1

French A1

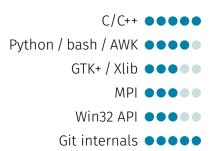
</> | Skills

Compiler Design / LLVM / clang •••••
Debugging (gdb, lldb) / Reverse Engineering ••••

OS Architecture / Linux kernel ••••

Embedded / Microcontroller-based Systems ••••
Software and Network Security / TCP/IP stack ••••

Technical Writing / Presentation ••••



Experience

2020-2023

Senior Applied Fellow (Software for Experiments group, ROOT project), European Organization for Nuclear Research (CERN), Geneva, Switzerland.

Detailed achievements:

- Contributions to RNTuple (the next-generation columnar I/O system for high-energy physics), outperforming HDF5 and Apache Parquet up to a factor of 2.2×. Specifically:
 - A storage backend for the Intel DAOS object store that provides up to $\times 16$ improvement over DAOS dfuse compatibility layer
 - A mechanism to allow for incremental updates of the data schema, a unique feature not present in other columnar storage solutions
 - Further improments in order to satisfy the requirements of the ATLAS LHC experiment, e.g. per-field post-read hooks and extensions to the type system. Liaison person for ATLAS I/O requirements.
 - Support for big-endian architectures and partial contributions to the design of zero-copy file merge
- Notable contributions to the cling LLVM-based C++ interpreter, e.g. supporting entity redefinition and general improvements to the unloading infrastructure
- Supervision of 5+ interns, mentor for CERN-HSF Google Summer of Code, and user training and support

2017-2020

Predoctoral Researcher (Computer Architecture and Technology Area), University Carlos III of Madrid.

Detailed achievements:

- \circ Contributed a prototype implementation of C++ contract-based programming for clang, demonstrating that contracts may make some libstdc++ functions $\sim 15\%$ faster
- Teaching Assistant in Real Time Systems, Operating Systems Design, Operating Systems, and Distributed Systems, achieving an average score of 4.23 out of 5 in the teacher evaluation surveys
- Held additional office hours on Real Time Systems and Operating Systems Design as part of the UC3M–PIEI International Students Programme 2018–2019
- July 2018 thesis defense committee member for BSc in Audiovisual System Engineering
- Advisor in 4 theses (BSc in Computer Science and Engineering)

2012-2013

Associate Engineer (devtools), Tuenti Technologies S.L., Madrid.

Detailed achievements:

- Co-authorship of a program to generate test fixtures based on anonymized real-world data, aiding in improving the test coverage
- Developed a utility for automated detection of mismatching application backend-database schema, assessing potential deployment issues
- Contributed a tool to characterize the development environment

2006–2011

System Administrator and Software Developer, Grupo Microsyscom, Madrid.

Detailed achievements:

- Took the administration of Debian GNU/Linux and FreeBSD, incl. ISC dhcpd, BIND9, Apache httpd, MySQL, and Squid services for 5–10 external clients, ensuring continued service; VPN (IPsec) and VoIP deployment. Incident response.
- \circ Implemented a RFB connection hub that relays data between a pair of RealVNC endpoints associated to a session identifier, reducing the time to start controlling a remote desktop by at least $5\times$
- Contributed to the automated migration from BIND9 to 4PSA DNS Manager

Education

2017-2020

Ph.D. in Computer Science and Technology, University Carlos III of Madrid.

Dissertation: "Balancing Perfomance and Reliability in Software Components",

graduated with honors – Cum laude

Research Stay: Jul 2019-Oct 2019 at CERN, for the ROOT project (EP/Software for Experiments group)

2016-2017

M.Sc. in Computer Science and Technology, University Carlos III of Madrid.

Thesis: "Automatic Classification of Drivers and Driving Style Using ECU Diagnostic Data"

2006-2011 ·

B.Sc. in Computer Science and Engineering, *University Carlos III of Madrid.*

Thesis: "fsniff: A software suite for capturing and analyzing application I/O", graded as passing with honors

■ | Selected Publications

Scientific Journals / Conferences

- A caching mechanism to exploit object store speed in High Energy Physics analysis. Cluster Computing (2022).
- Exploring Object Stores for High-Energy Physics Data Storage. In 25th International Conference on Computing in High Energy and Nuclear Physics (CHEP 2021).
- Relaxing the one definition rule in interpreted C++. In Proceedings of the 29th International Conference on Compiler Construction (CC 2020).
- Detecting semantic violations of lock-free data structures through C++ contracts. The Journal of Supercomputing volume 76, pages 5057–5078 (2020).
- Exploring stream parallel patterns in distributed MPI environments. Parallel Computing, Volume 84, Issue C, May 2019, pp 24–36.

Industrial Conferences

• Adding support for C++ contracts to Clang. 2019 European LLVM Developers Meeting (EuroLLVM'19).